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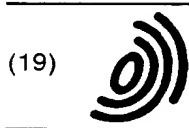
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(54) Installation mat for the components of a telephone handset

(57) A hand telephone includes inside its cover a printed circuit board (4) with components, and a display (2) and an earpiece (3) as separate components. According to the invention, the printed circuit board (4) and at least part of the separate components (2, 3) are mounted on an installation mat (1) of an elastic material forming a continuous mounting and attachment base without any other attaching means. The installation mat (1) is at the same time an integrated part of the keypad (9) of the hand telephone. The installation mat packs (13) the components (2, 3) against the casing and at the same time serves as a shock absorber.

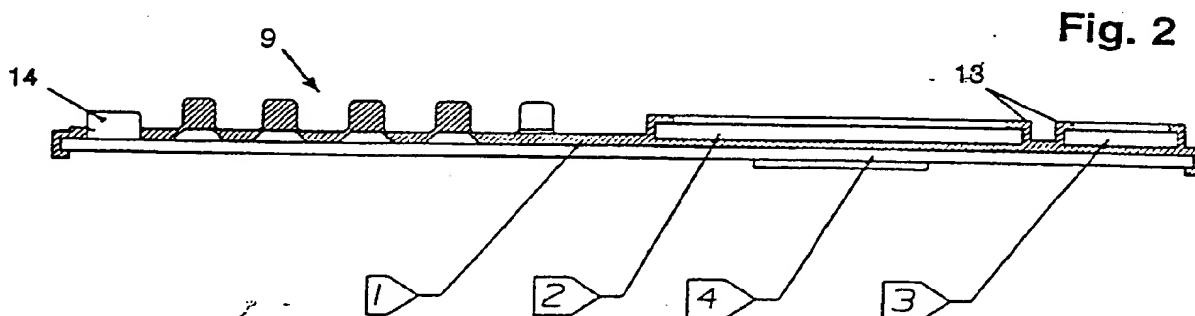


Fig. 2

Description

The invention relates to a hand telephone.

Here the word 'hand telephone' covers a wide range of meanings, so that it can be e.g. the handset of a telephone, the hand phone of a radio telephone, the handset of a mobile station, a mobile telephone, a pocket telephone, or a similar device. These devices usually include as separate components a microphone, an earpiece, push-buttons in the form of numeric keypads and other keys, a numeric or alphanumeric display etc., and a printed circuit board with the necessary electronic circuits.

In known hand telephones, separate components are installed in the body in various ways, e.g. using separate auxiliary frames. In current solutions, it is also difficult to seal the body well. It is often used separate packer rings or sealing tapes which do not always provide a reliable tightness against ambient particles, dust and humidity.

Current hand telephones usually use membrane keypads and one problem related to these is the correct installation of the keys and how to hold them in position; especially, how to have the outermost keys stay at the correct height with respect to the front cover of the body.

It is a disadvantage of these solutions that, in the assembly, several different components have to be handled that are often made of different materials as well. In practice, the attachment of separate parts requires a lot of manual labour which is expensive, as is well known. Because of rigid attachments the components of a hand telephone, particularly the display, may get damaged if the telephone is bumped against a hard object.

According to the invention, the installation mat provides a common, integrated installation base for the components of the hand telephone, thus avoiding the use of auxiliary frames and separate fixing means for the components. As the installation mat is made, according to the invention, of an elastic material, it protects the components against external impacts and twisting. The elastic material may be rubber or plastic with suitable compressibility characteristics, which, when compressed between the front and rear part of the body, provides a good packing between the parts and eliminates eventual gaps.

Advantageously, an installation mat according to the invention is part of the keypad of the hand telephone. Then the installation mat may include key-shaped protuberances, or nodules, which according to the principle of the known membrane keypad act on the electronic circuits of the keypad, such as capacitance switches or other coupling elements on the printed circuit board installed on the other side of the installation mat. The edges of the installation mat that lie against the side of the body may form a continuous bulge that provides a good support for the outermost keys of the keypad.

The installation mat may also serve as a mounting base and packing for the display, microphone and/or earpiece. Then the installation mat may include a suitably

fashioned cup-like "mounting hole" including the surrounding edges, where e.g. an earpiece can be easily installed. Then the earpiece is steadily positioned and, at the same time, the edges of the hole in the installation mat encircling the edges of the earpiece provide a good packing and shock elimination between the earpiece and the body of the hand telephone. The display circuit can be mounted in the same manner. In addition, the edges of the installation mat over the edges of the display can be used to border the display area, in which case a separate border print on the glass of the display circuit is not needed.

Since, according to the invention, the installation mat is made of an elastic material e.g. by injection moulding, pressing a sheet of material, or in any other known way, the installation method improves the impact resistance of the hand telephone and also wider tolerances are allowed in the positioning of components. Thanks to the elasticity of the installation mat the separate components mounted in the installation mat may have wider tolerances both in the vertical and horizontal direction so that these components are better fitted against the body. In fact, with this installation method, the separate components are "self-positioning". This enables automatic installation with simple means.

A special advantage of the invention is that during the assembly the separate components attached to the installation mat are "self-attaching". As for manufacturing, the installation mat enables the use of an application according to the in-one-go principle as all or at least the major part of the components of a hand telephone can be mounted on the installation mat in one work stage.

Naturally, the installation mat according to the invention can also be used in such a way that part of the separate components are assembled in the conventional manner in the auxiliary frame which then is installed into the installation mat as a separate component.

The installation mat according to the inventions allows for more freedom as to the pad configuration. Also a resonator cavity can be incorporated in connection with the beeper so as to amplify the signal thereof. The installation mat may be coloured according to its use.

Below, the invention is described in more detail using an example of an embodiment of a hand telephone, with reference to the enclosed drawings, where

Figure 1 shows a top view of an installation mat according to the invention;

Figure 2 shows a longitudinal section of the installation mat of Figure 1 along the centre line B - B and the separate components mounted on the installation mat;

Figure 3 shows a cross section of the installation mat of Figure 1 along the line A - A, when the installation mat has been installed in the body of a hand telephone.

The installation mat 1 shown in Figures 1 to 3 made of an elastic material provides a continuous mounting base for the components of a hand telephone. Figure 1 shows the structure of the installation mat 1 seen from above. It includes mounting holes for a display 2, earpiece 3, microphone 14 and beeper 12. The keypad 9 is made using the installation mat. In the corners of the installation mat 1 there are mounting holes 10, and at least around the keypad but advantageously around the whole installation mat there are thickened edges 11 which can be better seen in the cross section in Figure 3.

Figure 2 shows a longitudinal section along the centre line B - B, illustrating the installation mat 1 shown in Figure 1. This figure shows more closely the structure of the "mounting holes" in the installation mat for a display 2, an earpiece 3, a printed circuit board 4, and a microphone 14. It can be seen that the holes in the installation mat are encircled by edges that overlap the edges of the component installed in the hole and thus hold the component in position. For keys 9 the installation mat 1 includes elevated nodules that can be clearly seen in this cross section. The mounting nodules 15 in the corners of the installation mat hold the installation mat in position with respect to the keypad circuitry on the printed circuit board. In this figure it can be seen that the installation mat 1 effectively holds the separate components 2, 3, 4, 14 in position without any other separate attaching means. With a suitable dimensioning of the edges 13 of the mounting holes the components 2, 3, 4, 14 can move a little sideways so that they can be positioned at the possible guide profiles of the body 5, 6. With a suitable thickness of the installation mat 1 between the bottoms of the components 2, 3, 14 and the printed circuit board 4 the thickness tolerances for the body parts 5, 6 and the separate components 2, 3, 4, 14 can be somewhat bigger than usual and yet the attachment and packing of the components will be firm and reliable. Separate auxiliary frames are not needed for mounting the separate components 2, 3, 9, 13, 14.

Figure 3 is a cross-sectional presentation of the installation mat 1 mounted in the body of a hand telephone. The body includes a front part 5 and a rear part 6, and the installation mat 1 is mounted between them in a sealing fashion, on the mounting structures 8 of the body, and fastened with screws 7 or similar fasteners. The display 2, earpiece 3, microphone 14 and beeper 12 are held tightly in position between the printed circuit board 4 and the front part of the body, and between the bottoms of the components 2, 3, 12, 14 and the printed circuit board 4 there is part of the installation mat 1, and between the upper surfaces of the components 2, 3, 12, 14 and the front part 5 of the body there is an edge 13 surrounding the component and the component hole in the installation mat. This edge 13 packs the component and protects it against humidity and dust, for example. In addition, the edge 13 and the part of the installation mat under the bottom of a component act as an efficient absorber, protecting the component 2, 3, 12, 14 against im-

pacts and twisting.

Figures 2 and 3 show that the edge 13 of the installation mat 1 can be efficiently utilized with respect to the display 2 so that the edge 13 borders the edges of the display, in which case it is possible to leave out the nowadays customary border print of the display without impairing the appearance of the display. By choosing a suitable color for the material of the installation mat it is possible to create different appearance alternatives in an advantageous manner.

The integrated mounting base, or the installation mat 1, shown in Figures 1 to 3, can be manufactured by injection moulding, pressing a sheet of plastic, or in any other known way. The material should be suitably elastic and flexible, such as rubber or elastic plastic which, however, is sturdy enough, so that the edges 13 of the mounting holes in the installation mat 1 hold the installed components reliably in position. A person skilled in the art will know several suitable materials and methods for manufacturing an installation mat such as the one shown in Figures 1 to 3 and, therefore, a further discussion of such materials and methods will not be included here. However, let it be mentioned that the manufacturing of the installation mat according to the invention e.g. by pressing is simple and the resulting mounting base is impact resistant and elastic as well as cheap to manufacture.

The hand telephone in the embodiment example can be assembled e.g. in the following order. The required separate components are mounted in the mounting holes of the installation mat 1 - in our example, these are the display 2, earpiece 3, microphone 14 and beeper 12. The required electronic components (not shown) are assembled elsewhere on the printed circuit board 4 in a known manner - surface mounted, for example. The complete printed circuit board 4 is mounted in its mounting hole and the required conductors are connected to the printed circuit board. The resulting whole (1 - 4 in Figure 3) is placed in a cover, ie. the front part 5 of the body, against the mounting structures 8, and the other cover, ie. the rear part 6 of the body, is pressed onto the resulting whole. The parts 5, 6 of the cover are attached to each other with screws mounted from the part 6 side. Then the installation mat 1 receives the pressing force of the cover and is packed between the cover 5 and the printed circuit board 4. The outer edges 11 of the installation mat 1 can be suitably fashioned, so that in the assembly they will be compressed between the printed circuit board 4 and at least the cover 5, possibly also against the cover 6 (not shown). Then the thickened edges 15 of the installation mat keep the installation mat in its position in relation to the circuit board 4. At the same time, there will be an efficient packing between the separate components 2, 3 and the cover 5. With a suitable fashioning of the installation mat 1 it is possible to obtain, if necessary, a packing (not shown) for the seam between the front part 5 and rear part 6 of the body.

On the basis of the above description of the assembly it can be seen that the integrated installation mat ac-

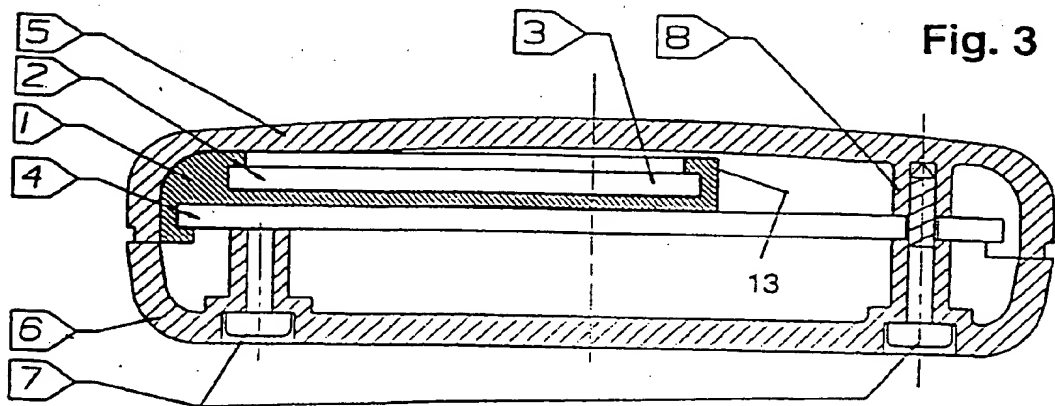
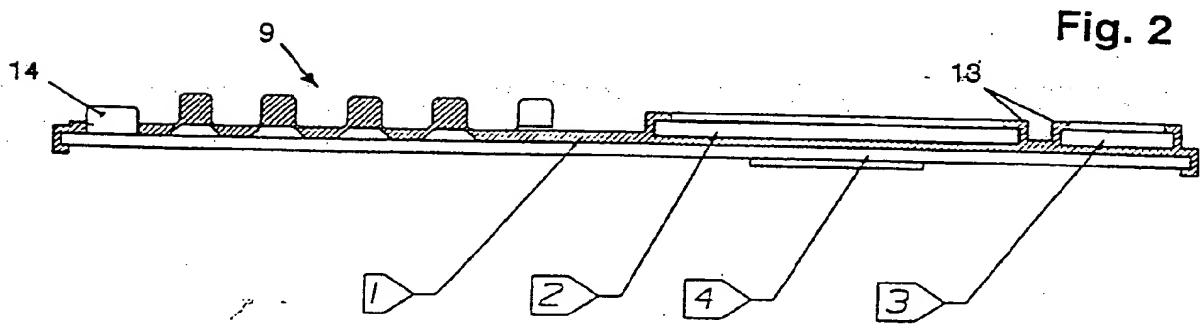
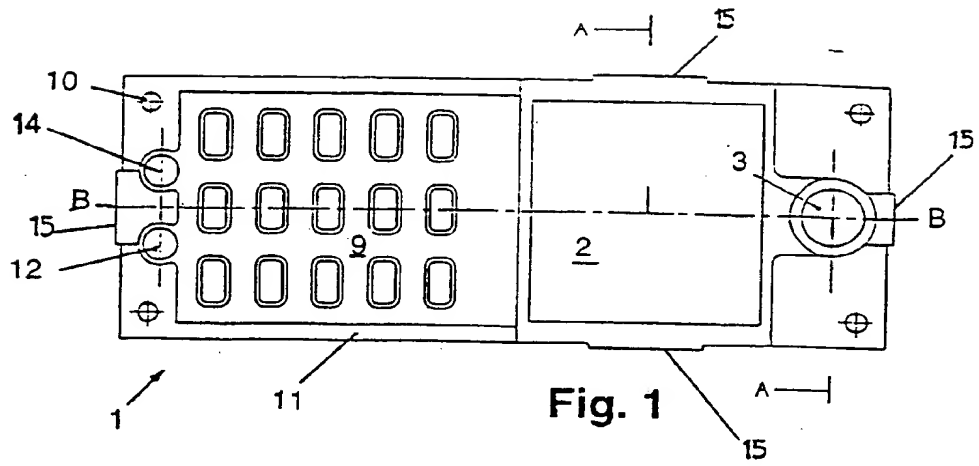
cording to the invention forms a simple whole. Compared to the conventional assembly of a hand telephone, many installation and attachment phases can be left out, so the use of the installation mat saves both time and costs. With a suitable fashioning of the installation mat it is possible to achieve a slightly compressible and elastic structure which is not susceptible to all impacts.

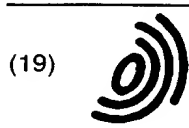
Claims

1. A hand telephone comprising a body (5, 6), a printed circuit board (4) with components, installed in the body, and other separate components installed in the body, characterized in that the printed circuit board (4) and at least part of the separate components (2, 3, 12, 14) are mounted on an installation mat (1) of an elastic material forming a continuous mounting and attachment base.
2. The hand telephone of claim 1, characterized in that the installation mat (1) is mounted securely between the parts (5, 6) of a two-part body.
3. The hand telephone of claim 1 or 2, characterized in that the installation mat (1) constitutes part of the keypad (9) of the hand telephone.
4. The hand telephone of any one of the preceding claims, characterized in that the separate components mounted on the installation mat (1) include an earpiece (3) and/or a microphone (12).
5. The hand telephone of any one of the preceding claims, characterized in that the separate components mounted on the installation mat (1) include an alphanumeric display (2) or a numeric display.
6. The hand telephone of claim 5, characterized in that the installation mat (1) forms an edge (13) bordering the display area of the display unit.
7. The hand telephone of any one of the preceding claims, characterized in that the installation mat (1) forms a packing (15) between the parts (5, 6) of the body.
8. The hand telephone of any one of the preceding claims, characterized in that the installation mat (1) is manufactured as one-piece.
9. The hand telephone of any preceding claim, characterized in that the installation mat (1) includes upstanding flanges (13) retaining the printed circuit board and/or said at least some separate components in position.
10. The hand telephone of claim 8, characterized in that

the mat acts as a sealing member along an interface between the body parts (5,6).

11. A method of assembling a hand telephone involving the step of introducing into the body (5,6) of the hand telephone a mat (1) made of elastic material which includes means by which separate telephone components can be secured at various locations to the mat.





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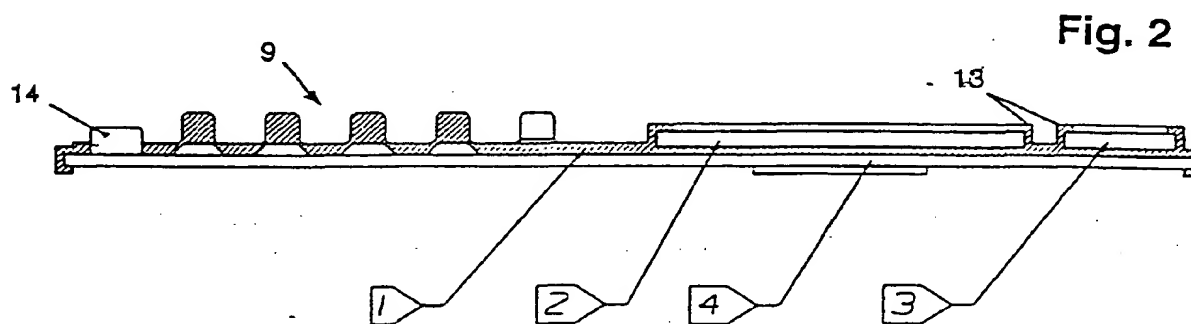


Fig. 2



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EUROPEAN SEARCH REPORT

Application Number

EP 95 30 6323

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	W0 85 03613 A (GNT AUTOMATIC AS) 15 August 1985 * abstract * * page 2, line 13 - line 18 * * page 3, line 5 - line 8 * * page 6, line 5 - line 11 * * page 11, line 34 - page 12, line 17 * * page 14, line 1 - line 19 * * figures 5,1 * ---	1-5,8,11	H04M1/02 H04M1/03
A	EP 0 610 689 A (SEDI SRL) 17 August 1994 * abstract * * column 1, line 1 - line 5 * * column 1, line 45 - line 50 * * figure 12 * -----	1	TECHNICAL FIELDS SEARCHED (Int.Cl.6) H04M
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 14 October 1998	Examiner Fragua, M
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